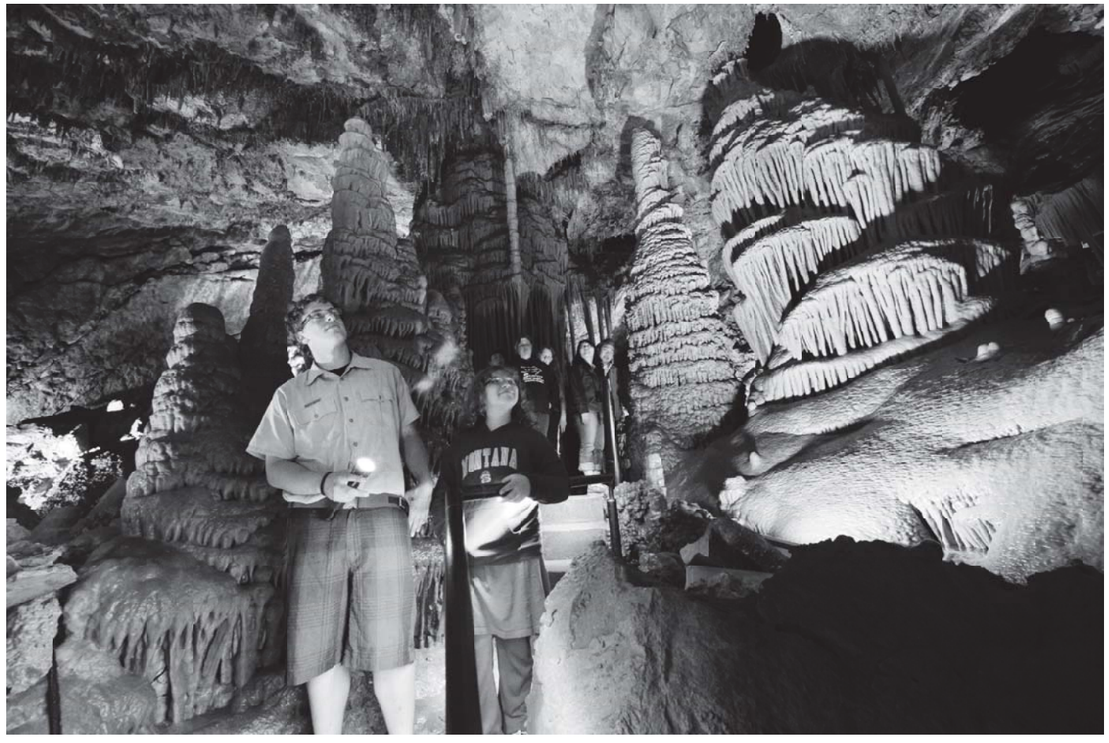
Lewis and Clark Caverns State Park
Railing and Lighting Upgrades 2018

FWP #7176603



Montana Fish, Wildlife & Parks

Drawing Index

Electrical Distribution and Lighting

Handrail Design and Details

Handrail Structural Design and Details

Owner

Montana Fish, Wildlife & Parks
Design & Construction
1522 Ninth Avenue (P.O. Box 200701)
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drawn MKE | check by MTF

issue log

For bidding	03/ 23/ 18

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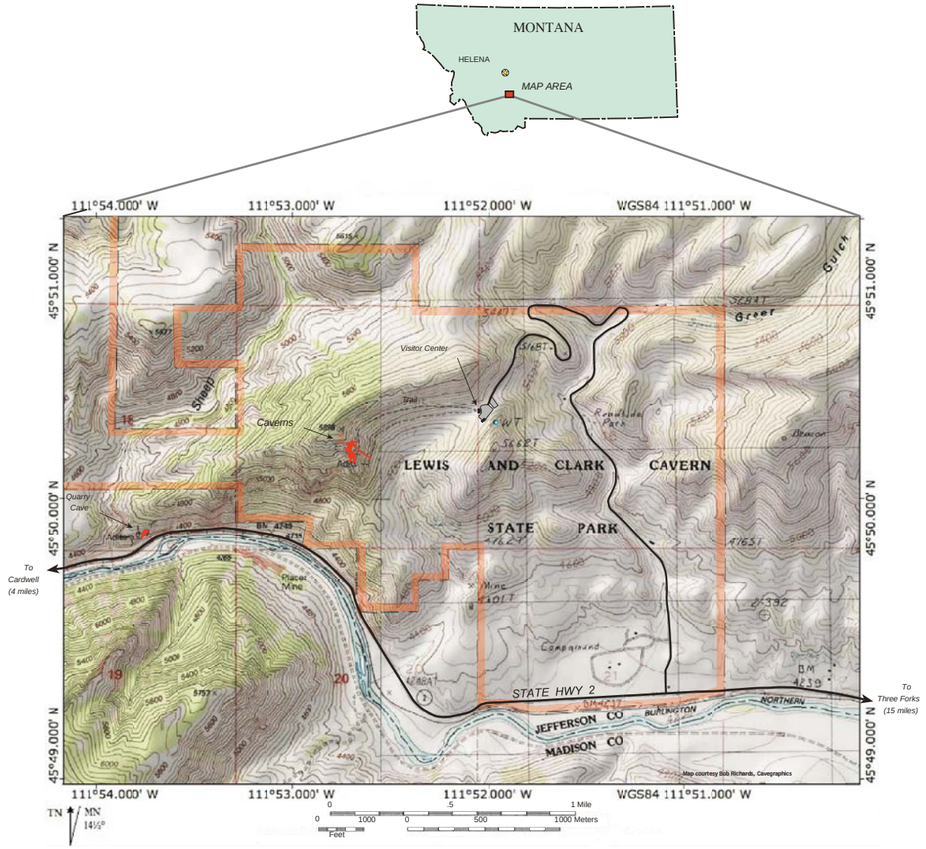
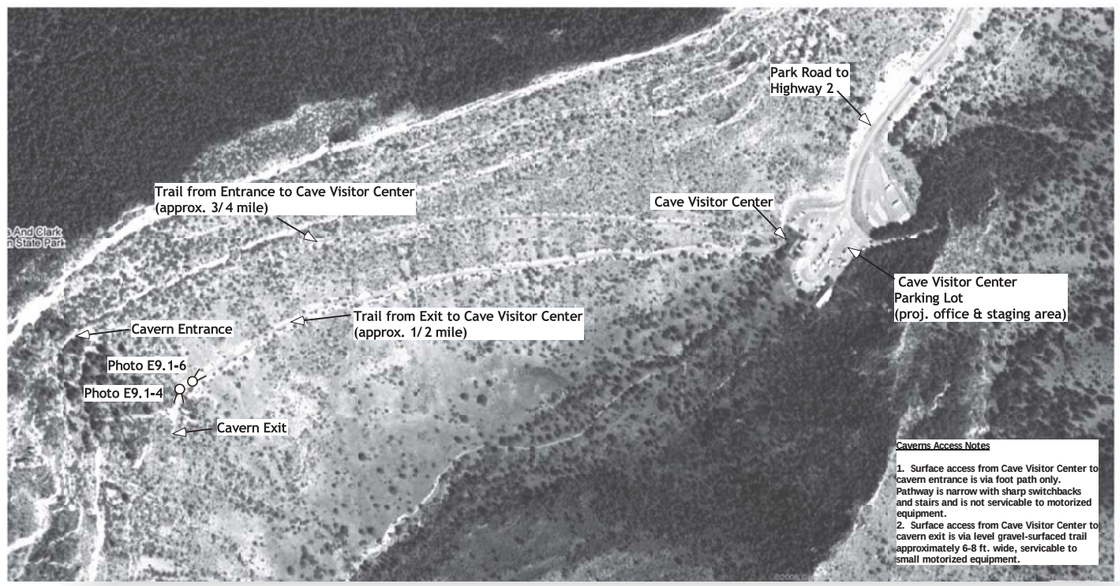


Caverns Area Location Map

SCALE AS INDICATED



Caverns Access Map

NOT TO SCALE

LEGEND

- Entrance dripline
- Breakdown blocks
- Flowstone
- Wall of Flowstone
- Columns
- Stalagmites
- Stalactites
- Clusterite (popcorn)
- Dirt, Silt or Sand
- Pool of water
- Slope (splay down)
- Original Existing Lights (splay direction) **All To Be Demolished, In Work Area Of Each Phase**
- Existing Wires (when visible)
- Bench or Storage Box
- **E2.2-15** Photo: Sheet Number, Photo Number, Direction of View
- **END R4 / END R4 CAB 1** Indicates the end of a branch circuit with corresponding identification which could indicate also the source Cabinet. Note that the end of splits within a branch circuit are also identified so there can more than one ending identification for the circuit
- **WALL MOUNT** Indicates that the light fixture typically Fixture 'F' is to be secured to the cavern wall using a junction box and appropriate stainless steel hardware. See relevant details this drawing package.
- **POST MOUNT** Indicates that the light fixture typically Fixture 'F' is to be secured to a post to be installed in the cavern floor or in cavern floor rubble. See drawings for post specifications, light fixture to post installation requirements, and post installation in the cavern floor.

- Passage walls
- Underlying passage walls
- Tourist Trail
- New Metal Railings
- Historic Trails
- Steps or Stairs
- Drop or ledge (lower on right)
- Ceiling drop (higher on right)
- Existing Telephone
- Existing Light Switches
- 34 Stair Number
- **R1-CAB 1 / R2-CAB 1 / R3-CAB 1 UPS** Indicates the passage from one sheet to the next, of specific branch circuits over and above leaky feeder cable and power feeder cabling. The suffix UPS indicates that this branch circuit is being used for the emergency lighting system.
- **SW1-CAB 1 / SW2-CAB 1** Indicates the passage from one sheet to the next, of specific switch control circuits over and above leaky feeder cable and power feeder cabling.
- Indicates the passage from one sheet to the next, of leaky feeder cable and power feeder cabling (NEW AND EXISTING SEGMENTS IDENTIFIED ON EACH SHEET)
- **SW-2, CAB 3 / SW-3, CAB 2** Indicates new switch and switch location, with identification of switch and cabinet number
- **MC** Indicates metal clad cable, PVC coated, Type PVC-MC
- **CORD** Indicates flexible cord, hard service, wet location, Type SOOW (See Catalog Sheets, Division 16900)
- **MC / J / CORD** Indicates transition between Type PVC-MC and Type SOOW
- Indicates a connection between cords or a take off for a fixture. The symbol does not necessarily indicate that a junction box is required. The symbol is primarily used to indicate the connectivity required.

MEASURED DISTANCES:

DISTANCE INFORMATION THAT MAY BE USEFUL TO THE CONTRACTOR.
USING A WHEEL BASE DISTANCE MEASURING DEVICE, THE FOLLOWING DISTANCES WERE MEASURED:

CAVE VISITOR CENTER TO CAVERN ENTRANCE (UPPER TRAIL)	3496 FEET	.66 MILES
CAVERN ENTRANCE TO EXIT TUNNEL	2353 FEET	.44 MILES
CAVERN EXIT TO CAVE VISITOR CENTER (LOWER TRAIL)	2453 FEET	.46 MILES

THE CAVERN TRAIL DISTANCES ARE MADE UP AS FOLLOWS:

ENTRANCE TO TOP OF PARADISE ROOM	1730 FEET
PARADISE ROOM TO PARADISE PLATFORM	47 FEET
PARADISE PLATFORM TO EXIT DOOR	124 FEET
EXIT DOOR TO CAVERN EXIT	452 FEET
SUBTOTAL	2353 FEET

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MKE	MTF

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sheet **G 1.0**

General Project Requirements

1. Resource Protection: Contractor shall exercise care throughout the project area to safeguard and protect the natural features of the caverns, surface access areas and overall park environment. All motorized equipment shall be confined to existing roads and trails. No off-road activity is permitted. Alterations to or removal of existing cave features shall be limited exclusively to those areas, features and activities noted in the drawings and/or specifications. Any other alterations or destructive activities proposed in order to complete the work, shall be reviewed and approved by Park Manager via Cave Specialist and Project Engineer prior to commencement of work.

2. Sanitation: Contractor shall provide on-site sanitation facilities for work crews. Use of Park sanitation facilities is not allowed. Location(s) for contractor sanitation facilities shall be coordinated and approved by the Owner (Park Manager).

3. Mobilization: Contractor shall be provided with a mobilization and equipment/material storage and staging area in the Cave Vistor Parking Lot. Contractor shall be responsible for providing security for all equipment and material stored in such area. All contractor equipment and material shall be contained in the designated storage and staging area at all times.

4. Overnight Lodging: No overnight lodging or parking of portable housing units(RVs, trailers, campers etc) is available or allowed within the boundaries of the Lewis and Clark State Park. Construction office and/or storage trailers allowed at Cave Vistor Parking Lot. Electrical available.

5. Cave Access: Access to cave entrance from the Cave Visitor Center is via paved pedestrian pathway 3-4 ft. wide. Pathway is not serviceable for motorized equipment. Access to cave exit from the Visitors Center is via a gravel-surfaced trail 6-8 ft. wide that is level and serviceable for small motorized equipment Approximately 40 yards from the cave exit, the trail widens to approximately 14 ft. This location is available for portable toilet facilities and/or equipment or material storage.

6. Waste Disposal: Contractor shall be responsible for collecting and maintaining storage of all construction debris and waste on the site each day. Waste and debris generated from all construction activity shall not be allowed to disperse but shall be confined in approved waste disposal equipment stationed in an approved waste storage and collection area. Waste shall be disposed of off-site at an approved waste disposal location. No disposal of any waste shall be allowed on the site or within the Lewis and Clark State Park boundaries.

7. Special Conditions: Contractor is referred to the Special Conditions section of the Specifications for additional requirements.

8. Project Documentation: The contractor and contractor's subcontractors and consultants shall be thoroughly familiar with all of the bid documents, specifications, and drawings as this a very integrated project with required information regarding project requirements located throughout the project package. The contractor cannot be successful breaking up this project into independent disciplines.

General Project Notes:

1. FOR THIS PROJECT, ALLOWABLE NEW CONDUITS ARE RESTRICTED TO SCHEDULE 40 PVC CONDUIT AND LIQUIDTITE FLEXIBLE CONDUIT ONLY.

2. ON THESE DRAWINGS, WHERE THE TERM "CONDUCTORS" IS USED IN A NOTE (SUCH AS "ROUTE CONDUCTORS BEHIND FORMATION" OR "ROUTE CONDUCTORS UNDER STAIRS" OR NOTE #3 BELOW), THAT TERM SHALL BE UNDERSTOOD TO INCLUDE POWER FEEDER(S), BRANCH CIRCUIT(S) AND/OR CONTROL CABLE(S) IN THAT GENERAL AREA OR LOCATION.

3. CONTRACTOR IS ADVISED THAT THE TWO VIEWS PRESENTED ON THESE SHEETS INCLUDE PLAN AND PROJECTED PROFILE. THE CONDUCTOR ROUTING IS APPROXIMATE AND DOES NOT REFLECT COMPLETELY THE VERTICAL AND HORIZONTAL VARIATIONS OR ROUTING AROUND SEGMENTS OF FORMATION. CONTRACTOR IS CAUTIONED THAT MEASURING CONDUCTOR LENGTHS FROM THESE DRAWINGS WITHOUT CONSIDERING THE TERRAIN VARIATIONS MAY RESULT IN INACCURACIES.

4A. WHEN A PARTICULAR AREA HAS BEEN COMPLETELY RELIGHTED, THE CONTRACTOR SHALL DEMOLISH AND SAFETY OFF VISIBLE SEGMENTS OF EXISTING LIGHTING CONDUCTORS SERVING THOSE DEMOLISHED LIGHT FIXTURES AS DIRECTED BY THE CAVE SPECIALIST.

4B. IN THIS CONTEXT AND FOR THIS PROJECT, DEMOLISH SHALL MEAN REMOVE ALL ELECTRICAL EQUIPMENT FROM THE SOURCE OF ELECTRICAL POWER AND REMOVE ATTACHMENTS AND MOUNTING HARDWARE . THE CONTRACTOR SHALL NOT DISTURB ANY EXISTING CONDUCTORS WHERE THE CAVERN FORMATIONS HAVE GROWN UP (OR DOWN) AROUND THE CONDUCTORS, OR WHERE DEMOLITION OF CONDUCTORS OR EQUIPMENT WOULD POSE A RISK OF DAMAGING CAVERN RESOURCES. VERIFY ALL DEMOLITION WITH THE CAVE SPECIALIST.

EXISTING (DEMOLISHED) ENCLOSURES, RELAY PANELS AND ELECTRICAL PANELS SHALL BE REMOVED BY THE CONTRACTOR.

5. CABLE CLAMP SUPPORT SHALL BE NON-RUSTING (STAINLESS STEEL, LEXAN, FRP, OR SUITABLE PLASTIC) AN ATTACHED TO THE WALL USING STAINLESS STEEL BOLTS GROUTED TO PROVIDE A PERMANENT NON RUSTING ATTACHMENT POINT. ADJUST BOLT LENGTH AND SIZE TO SUIT SPECIFIC MOUNTING LOCATIONS, WEIGHT TO BE SUPPORTED, AND WALL MATERIAL. GALVANIZED STEEL IS NOT CONSIDERED TO BE NON RUSTING. ALUMINUM IS REGARDED AS HIGHLY CORROSIVE WHEN ATTACHED TO ROCK WALLS OR CONCRETE.

6. ALL FASTENERS SHALL BE NON-RUSTING SUCH AS STAINLESS STEEL, LEXAN, FRP, OR SUITABLE PLASTIC. GALVANIZED STEEL IS NOT CONSIDERED TO BE NON RUSTING. ALUMINUM IS REGARDED AS HIGHLY CORROSIVE WHEN ATTACHED TO ROCK WALLS OR CONCRETE.

7. THE CONTRACTOR SHALL PROVIDE A COMPLETE SUBMITTAL REGARDING THE MEANS AND METHODS FOR CONSTRUCTING TRAIL CROSSINGS WHERE SAW CUTTING OF EXISTING CONCRETE IS REQUIRED. AS A MINIMUM THERE CAN BE NO DUST OR WATER DISCHARGED INTO THE CAVERN ENVIRONMENT, THE REPLACEMENT CONCRETE SHALL BE NON SHRINK, WITH AGGREGATE SIMILAR TO EXISTING TRAIL, COLORED TO BLEND WITH THE EXISTING TRAIL, AND A MINIMUM 2 INCH COVER OVER SCHEDULE 40 PVC SLEEVES. COMPLY WITH CONCRETE SPECIFICATIONS, DETAIL 5, SHEET RSD-1.2.

8. SWITCHING IS SHOWN SCHEMATICALLY FOR CONTROLLING A VARIETY OF RELAYS IN SINGLE CABINETS AND SOMETIMES SEVERAL RELAYS IN MORE THAN ONE CABINET. SUCH MULTI-CABINET CONTROL MAY REQUIRE ISOLATING RELAYS DEPENDING ON THE PARTICULAR CONTROL SYSTEM BEING USED IN THE PROPOSED RELAY CABINETS. THE CONTRACTOR SHALL FURNISH AND INSTALL SUCH RELAYS AS REQUIRED. NOTE ALSO, THAT THE CONTRACTOR MAY USE A SINGLE MULTI-CONDUCTOR CORD FOR SWITCH LEADS AND CABINET TO CABINET INTERCONNECTION. VERIFY SWITCHING WITH CAVE SPECIALIST.

9. THE WORD 'CONTRACTOR' MEANS THE CONTRACTOR AS A TEAM - NOT JUST A SINGLE INDIVIDUAL.

Cavern General Requirements

1.1 Lewis and Clark Caverns requires constant stewardship to protect its fragile environment and geological treasures. The uniqueness of the Caverns requires special care to prevent any possible change and/or damage. Millions of years of natural development can be drastically altered in an instant. Anyone working in the Caverns must be aware of the possibilities, and everyone must make it a personal goal to take only memories and leave only footprints inside Lewis & Clark Caverns State Park.

1.2 The Contractor shall take all necessary precautions to prevent damage to all natural formations inside the Caverns. The Contractor, with the approval of the Lewis & Clark Caverns Staff, shall clearly mark with engineering marking tape the paths where workers must follow when off the existing path. All workers shall stay within the marked lines of the temporary paths. The Contractor shall remove the temporary markings when the work is completed.

1.3 The Contractor must seek approval from the Cave Specialist before removing any natural materials from the Caverns. All material removed must be documented as to type, quantity and disposition.

1.4 Accidental damage to the Caverns must be reported to the Cave Specialist immediately, documenting the time, day, date, conditions, and person causing the damage and supervisor.

1.5 The Contractor shall be responsible for any malicious damage to the Caverns during the construction project. Employees causing malicious damage shall be dismissed immediately and banned from the project permanently. Malicious damage to the Caverns shall be prosecuted to the fullest extent of the law.

1.6 The Contractor, its employees including all sub-contractors and their employees, must attend at least a four-hour orientation by the Lewis & Clark Caverns Staff prior to commencing any work inside the Caverns. This orientation shall be provided to the Contractor by Lewis & Clark Caverns staff without any additional cost to either party. The Contractor shall make employees available at no additional cost to Lewis & Clark Caverns staff for this orientation.

1.7 Contractors and their employees must wear gloves inside the Caverns to prevent the touching of any geological formations by a person's hands.

1.8 Contractors and their employees must wear all standard safety equipment, including work shoes, safety glasses when required, and head gear.

1.9 No food or drinks, except water, shall be taken into or used inside the Caverns.

1.10 No tobacco products of any kind may be taken into or used inside the Caverns.

1.11 All conduits, cables, junction boxes, control panels and other electrical equipment shall be concealed from the public view to the maximum extent possible, with the exception of exact locations directed in these plans and accompanying photos. If conduit must be installed underground, conceal and/or cover the excavated area with materials native to the Caverns.

2. WHITE NOSE SYNDROM

2.1 White Nose Syndrome Precautions: All equipment, clothing, and personal protective equipment (PPE) shall be decontaminated prior to entering the cave. Decontamination procedures; the latest washing and decontamination protocols are found at https://www.whitenosesyndrome.org/topics/decontamination). In general, the procedures are to remove mud and other debris off-site before beginning decontamination. For decontaminating footwear, gloves, coveralls, cave suits, packs, and other washable gear, heat water to a minimum sustainable temperature of 60 ^{0}C or 140 ^{0}F and fully immerse items for a minimum of 20 minutes before drying. For decontaminating headlamps, helmets, tubs and other nonporous gear, use Lysol wipes or a 10% bleach mixture to fully wet and wipe down all surfaces.

No materials, supplies, equipment or gear that has been in WNS areas can be used by the contractor or sub-contractors, even with decontamination. A map of affected states is available at https://www.whitenosesyndrome.org.

3. WORK SURFACES/STAGING AREAS

3.1 The Contractor may use the existing paths and steps for temporary work surfaces and staging areas. The Contractor must provide adequate protection when using the existing paths and/or steps. The Contractor shall provide a list of areas to be used and the suggested protection required. The Cave Specialist must approve the suggested protection needed for each area prior to the Contractor proceeding. The existing paths and steps must be returned to the original condition upon completion of the work, unless the work is upgrading the existing paths and steps.

3.2 Geological formations shall not be used for temporary work surfaces in any manner. When directed by the Cave Specialist, the use of any part of the Caverns shall be terminated immediately.

3.3 Before proceeding, the Contractor shall provide details of any work areas, staging areas and temporary storage facilities to be established outside the Caverns. The details shall include ground plans, heights, weights and utilities required for temporary structures; list of materials with particular attention to any hazardous materials to be stored in the temporary facilities. The Contractor must receive Park Manager written approval before proceeding.

4. TOOLS/ELECTRICAL MATERIALS

4.1 Powered tools used inside the Caverns shall be limited to electrically powered tools. Any electrically powered tools producing heat shall be pre-approved for use by the Cave Specialist.

4.2 No paints or solvents of any type may be used inside the Caverns without prior approval by the Cave Specialist.

4.3 Electrical tape used inside the Caverns shall be limited to 3M Scotch Type 70, self-fusing silicone rubber electrical tape, Class "H" Insulation, and 3M Scotch 130C Linerless Rubber Silicone tape for low and hi voltage (thru 69KV). No other electrical tape may be used.

4.4 No commercially available pulling lubricant, such as Scotch Yellow 77, shall be used inside the Caverns. When required, pulling lubricant shall be water.

4.5 Substitutions for any of the above materials may be proposed by the Contractor in writing. Substitution products proposed by the Contractor must demonstrate the same characteristics as the original. The Contractor shall be responsible for providing test results substantiating the characteristics, for submission of samples to the Fussell Engineering, and for sufficient time for the Project Engineer's evaluation. Substitutions may not be used unless approved in writing by the Project Engineer.

5. CAVE SPECIALIST

5.1 Fussell Engineering will provide a full time Cave Specialist. The Cave Specialist will present in the cavern during construction. The Cave Specialist will be familiar with current lighting system and new rail/lighting plans prior to the start of construction. The Cave Specialist will be backed by the Project Engineer and the Park Manager.

The Cave Specialist will have two major responsibilities:
1. Protect the cavern resources and the environment during construction This includes the bat population.
2. Assist the Contractor with routing and hiding the electrical and railing infrastructure being installed..

First, the Cave Specialist will be available to answer questions regarding means and methods of construction as they pertain to cavern protection. Should an issue arrise, the Cave Specialist will have the authority to temporarily stop construction and resolve the issue before damage to the cavern occurs. It may be necessary to engage the Park Manager and/or the Park Assistant Manager as they are quite familiar with the Phase 1 construction. The Project Engineer and/or FWP Construction Manager could be involved if required. The goal is resolve issues quickly, protect the cavern, and not inhibit the construction progress.

Second, the Cave Specialist has knowledge of the cavern and thus can assist the contractor in how the electrical infrastructure can be installed and routed within the cavern. In addition, the Cave Specialist can assist in railing installation in providing real time evaluation and response to installation questions. These functions are especially important because it is impossible to provide 3D drawings with this information.

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ADDITIONAL PROJECT INFORMATION

Additional Demolition Narrative

The Contractor shall demolish existing railings, existing old electrical cabinets, wiring, and other existing electrical and railing infrastructure that is no longer needed and thus should be removed from the cavern. This work shall be in consultation with the Cave Specialist. The goal is to remove everything that is possible without damaging the cavern. Emphasis will be for that existing infrastructure which is visible and/or unsightly that can be removed without damaging the cavern resources. The protection of the cavern is paramount and some existing electrical infrastructure may be visible but cannot be removed without damaging the cavern.

Nearly all of the existing cords that are loose laid on the surface of the cavern shall be removed from the cavern. Some cords may be wedged in places where access is difficult. For places where the entire existing cord cannot be removed, the Contractor shall remove that part of the cord that can be removed.

The existing tunnel trail theater like incandescent lighting shall be demolished. See RSD-1.1 for patching the existing pockets that supported the existing trail lighting.

The existing service feeder supplying the cavern from above to Cabinet #4 shall not be damaged or removed. This feeder will be used to provide a loop feed to the cavern for as long as this existing feeder is functional.

When the Project is completed, the Contractor shall remove the existing feeder supplying power to the bottom of the cavern from the outside main panel. This feeder shall be demolished where possible and practical up inside the cavern to Cabinet #4.

All demolished material shall be recycled as possible. This narrative superseeds any other information on the drawings and in the specifications that may incorrectly indicate demolition is not in the contract.

Fixture Connections

The Contractor shall provide a cord set for each new and existing light fixture both already installed and being installed. This also includes the existing spare fixtures (9 Fixture 'A') and new fixtures to be used as spares. The plug on the fixture shall be a 20 amp, 120 volt, twist lock male wiring device. The connection on the cord shall be a 20 amp, 120 volt, twist lock female wiring device. The cord length shall be adjusted for each fixture to provide location flexibility without a large amount of excess cord to be hidden from view.

Fixture Bases

The Contractor shall provide a base for fixtures as follows:

Existing Fixture 'A': The installed Fixture 'A' have bases. The contractor shall furnish and install bases on 9 existing spare Fixture 'A'.

Existing Fixture 'B': Nearly all of the existing Fixture 'B' have bases. For this Work, the Contractor shall provide bases for 20 existing Fixture 'B' and 20 new Fixture 'B'.

New Fixture 'C': The Contractor shall furnish and install new bases on 40 Fixture 'C'. Fixture 'C' housing and base are the same as what is currently being used for Fixture 'A'.

Fixture 'F': Fixture 'F' is wall mounted and does not need a base.

Fixture 'A' and 'C' bases are described on a catalog sheet in Specification Section 16900.

Fixture 'B' existing bases are indicated on photos this sheet.

Leaky Feeder Cable and Existing Sleeves

The existing leaky feeder cable is installed in the cavern from the outside base structure to Cabinet #1 and thence to the future Cabinet #4 location. The cable is a yellow cable with a size similar to a RG6 coaxial cable. This cable crosses the trail in a PVC sleeve as described in these drawings. There should be room in the existing sleeve for some cords.

There is likely some adjustment in the location of some of the trail crossings. To identify the exact existing crossing location, use the yellow leaky feeder cable as a guide. Therefore additional sleeves may need to be installed for the branch circuit cabling.

Cords

The contractor shall furnish and install branch circuit cords between the Cabinets and the light fixtures and railing as indicated on the drawings. All of the existing branch circuits in the cavern shall be replaced except for branch circuit cords installed in Phase 1.

The cord shall be 12-3 SOOW heavy duty cord. The cord shall be located on the surface or underneath formations but not under rocks or other installations which can damage the cord. In some places, MC plastic coated MC cable or Tek cable must be used. Locations requiring plastic coated MC cable or Tek cable are indicated on the drawings. As the branch circuits are installed, there may be other locations that require this cabling.

In addition, the contractor shall furnish and install 4 interface cords. The interface cord consists of an 8 foot long SOOW cord with a male twist lock plug and a female straight blade receptacle. The intent is to allow the Owner to disconnect a light fixture and use the interface cord to plug in a battery charger for their battery operated vacuum cleaners.

UPS Emergency Power

The contractor shall move the existing UPS in Cabinet #1 to new Cabinet E3. Discard and recycle the existing batteries. Furnish and install new batteries in new Cabinet #3.

Furnish and install new 2000 watt UPS in Cabinet #1 with new batteries. An additional cabinet will be required. Mount this cabinet on the rear of the existing UPS cabinet. Size this cabinet for the batteries that will not fit in the existing UPS cabinet.

Summary of UPS sizes:

Cabinet #1	New 2000 watt UPS and batteries
Cabinet #2	New 2000 watt UPS and batteries
Cabinet #3	Existing 1500 watt UPS and new batteries
Cabinet #4	New 1500 watt UPS and batteries

Flashing Fixture 'A'

There are 42 existing Fixture 'A' whose light color must be adjusted. Northern Rockies Agency (NRA) will be under contract directly from the State of Montana. NRA will set up their computer and interface box on a table in the Paradise Room.

The Cave Specialist will unplug each fixture and bring it to the table.

The Contractor shall remove the existing straight blade male plug. The Contractor will then remove some of the cord jacket (about an inch) to expose one of the conductors that is clipped off. The clipped conductor is used to communicate with the light fixture's internal control. Each fixture will be programmed which will take about 15 minutes. The Contractor will then clip off the communication wire and then install a new twist lock male plug.

At this time or during the main construction, the Contractor shall replace the existing straight blade female receptacle supply to Fixture 'B' with a twist lock female receptacle. If this work is done while the cavern is open to the public, the receptacle must be converted to twist lock in order to keep the Fixture 'B's operational. If this procedure is done after the cavern is closed, the changeout of Fixture 'B' supply straight blade receptacle to the twist lock receptacle can be done most any time.

Contact NRA to schedule this work at 406-587-0513.

Existing Trail Incandescent Lights

The existing trail lighting consists of rectangular type fixtures recess mounted in the concrete stairs and surface mounted on the cavern walls in the tunnels. See Photo E1.1-1 for a recessed fixture and Photo E1.1-5 for a surface mounted fixture.

See the Railing Drawings and Specifications for the demolition of recessed fixtures in existing stairs. See specifically sheet RSD-1.1 specifications for patching holes in concrete where light fixtures are removed

For those existing fixtures surface mounted on the cavern walls, the Contractor shall remove them and the supply conductors. It is not necessary to fill the bolt holes nor demolish the supply branch circuit where hidden and not visible from the trail.

Fixture counts are:
6 existing trail light fixtures in concrete pockets integral to concrete stairs
21 existing trail light fixtures mounted on tunnel walls or laying on the ground adjacent to the trail.

Railing Lighting

The replacement of the existing railing lighting in the Paradise is described on drawing sheet E7.0.

New lighted railings are described on the Railing Drawings and in the railing specifications. Note that the new lighted railings may be supplied by the railing manufacturer with or without LED lighting.

A lighted railing supplier may already have a relationship with a strip LED lighting manufacturer whose product is compatible with the lighted railing manufacturer. In this case, the railing and the lighting could be purchased together. Since the railing is assembled and installed in the field, the installation of the lighting system may also need to be installed in the field. The variations in the railing installation system and the corresponding lighting system are too numerous to select a lighting system until the railing system is known.

However, the general requirements for the railing lighting is indicated on a catalog sheet in Specification section 16900.

The railing lighting system shall be rated to supply at least 5 foot candles underneath the railing on a normal outside path.

The railing lighting shall be dimmable with a wireless dimming system. See the catalog sheets in the Specification section 16900 for the dimming system. The railing lighting shall be equipped with a diffuse lens that obscures the LED source chip in order to supply even lighting even when viewing the rail lighting from below.

The LED driver(s) shall be remotely located in a composite non-metallic NEMA 4X enclosure with a gasketed screw cover. The color of the enclosure shall be conducive to hiding the enclosure. The LED driver enclosure shall be located on the cavern floor or located behind a rock or formation. There is no mounting required. The driver enclosure shall be hidden from view from the trail. Because of the non-metallic enclosure, the hand held wireless dimmer control can communicate with the LED driver in the enclosure from the trail.

For all new railing lights, there shall be a driver for each illuminated railing. More than one driver could be located in a single enclosure. This will allow the Owner to adjust each railing light level down to the appropriate light level.

The Contractor shall provide a submittal to the Project Engineer for the proposed lighting system to be used with the selected railing system.

LED Dimming

For both the railing and Fixture 'F' dimming, price the following for the Dim Chip (see catalog sheet in 16900):

a. one Dim Chip for each railing driver.
b. one Dim Chip for each Fixture 'F'.
c. one Dim Chip DC01, DC02, and DC03 (one of each of the three versions).
d. four spare Dim Chip devices.

Order item c, Dim Chip DC01 and DC02 and DC03, a total of three devices. Using one railing and one Fixture 'F', install and test with Cave Specialist, each version (DC01, DC02, and DC03) to determine which of the modules' adjustment range best fits the railings and do the same for Fixture 'F'. When completed, order the Dim Chip version for the railings and the Dim Chip version for Fixture 'F'. If different, order 2 of each for spares. Otherwise order 4 spares.

For the railing, furnish and install a Dim Chip in the NEMA 4X driver enclosure, one for each driver. The Dim Chip does not need its own enclosure. Connect each Dim Chip to the corresponding driver 0-10 volt control wiring using the connector cable. There is one Dim Chip for each driver for each railing. Thus the Dim Chip is adjusted specifically for the railing light level, The Dim Chip maintains the railing light level through switching of the railing. See Dim Chip catalog sheet in 16900.

For Fixture 'F' furnish and install the Dim Chip device inside the Fixture 'F' enclosure. Adjust the setting to the light level required by the Cave Specialist. See catalog sheet in 16900.

EXISTING FIXTURE 'B' BASE

EXISTING FIXTURE 'B' BASE

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Railing and Lighting Upgrades 2018
FWP #7176603

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sheet
G3.0

GENERAL NOTES:

A. AT ANY LOCATION WHERE ELECTRICAL BRANCH CIRCUIT OR SWITCH CABLES ARE TO BE LOOSE LAID (NOT COVERED WITH RUBBLE), USE FLEXIBLE CORD, HARD SERVICE, WET LOCATION TYPE SOOW.

B. AT ANY LOCATION WHERE ELECTRICAL BRANCH CIRCUIT OR SWITCH CABLES ARE TO BE COVERED WITH RUBBLE, USE CONDUCTORS IN PLASTIC COATED FLEXIBLE CONDUIT, OR PLASTIC COATED MC CABLE, OR TEK CABLE AT CONTRACTOR'S OPTION.

C. AT ANY LOCATION WHERE ELECTRICAL BRANCH CIRCUIT OR SWITCH CABLES ARE TO BE FASTENED TO THE CAVERN WALL, FASTENED TO A CONCRETE WALL, OR FASTENED TO THE SIDE OF OR UNDERNEATH CONCRETE STEPS, USE PLASTIC COATED MC CABLE OR TEK CABLE AT THE CONTRACTOR'S OPTION.

D. USE JUNCTION BOX AT ANY TRANSITION BETWEEN CORD AND CABLE; CONCEAL J-BOX FROM TRAIL VIEW BEHIND NATURAL CAVERN FORMATION OR UNDER RUBBLE.

E. POWER FEEDER CABLE TO BE TEK CABLE THROUGHOUT THIS PHASE OF PROJECT.

F. ROUTE POWER FEEDER CABLE TO FOLLOW ROUTE OF EXISTING LEAKY FEEDER COMMUNICATIONS CABLE.

SWITCH MOUNTING NOTES FOR THIS SHEET

1. MOUNT SWITCH SW1-CAB 4 SECURED TO THE EXISTING CAVERN TUNNEL WALL MOUNTED AT 42 INCHES ABOVE TRAIL.

LIGHT FIXTURE(S) THIS SHEET

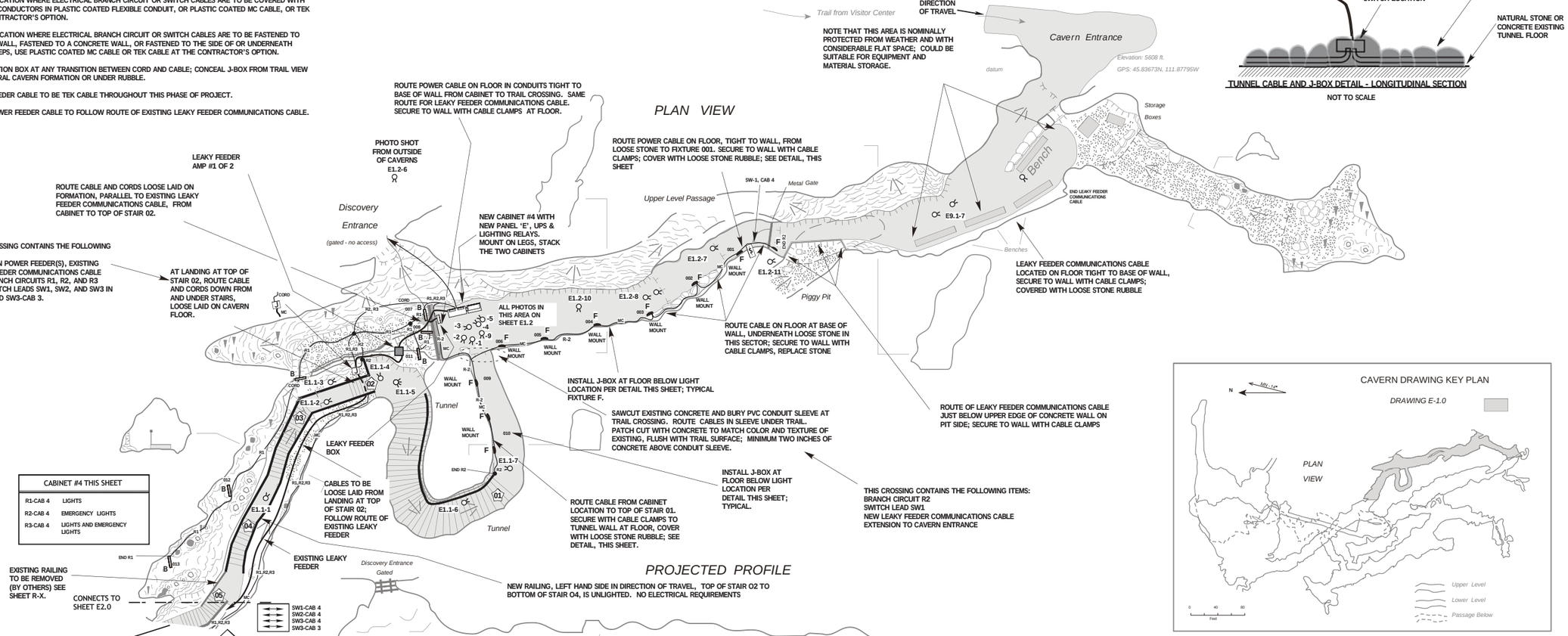
FIXTURE 'B' IS AN EXISTING COMPOSITE BULLET WITH VARIOUS LED PAR LAMPS
FIXTURE 'C' IS A NEW TUNABLE WHITE FIXTURE (SEE CATALOG SHEETS)
FIXTURE 'F' IS A NEW WALL MOUNTED LED FIXTURE (SEE CATALOG SHEETS)

TEK CABLE UP TO SWITCH OR LIGHT FIXTURE
JUNCTION BOX AT EACH LIGHT FIXTURE AND/ OR SWITCH LOCATION
ATTACH MC CABLE TO WALL AT FLOOR WITH CABLE CLAMPS; COVER WITH LOOSE STONE RUBBLE
NATURAL STONE OR CONCRETE EXISTING TUNNEL FLOOR

TUNNEL CABLE AND J-BOX DETAIL - LONGITUDINAL SECTION

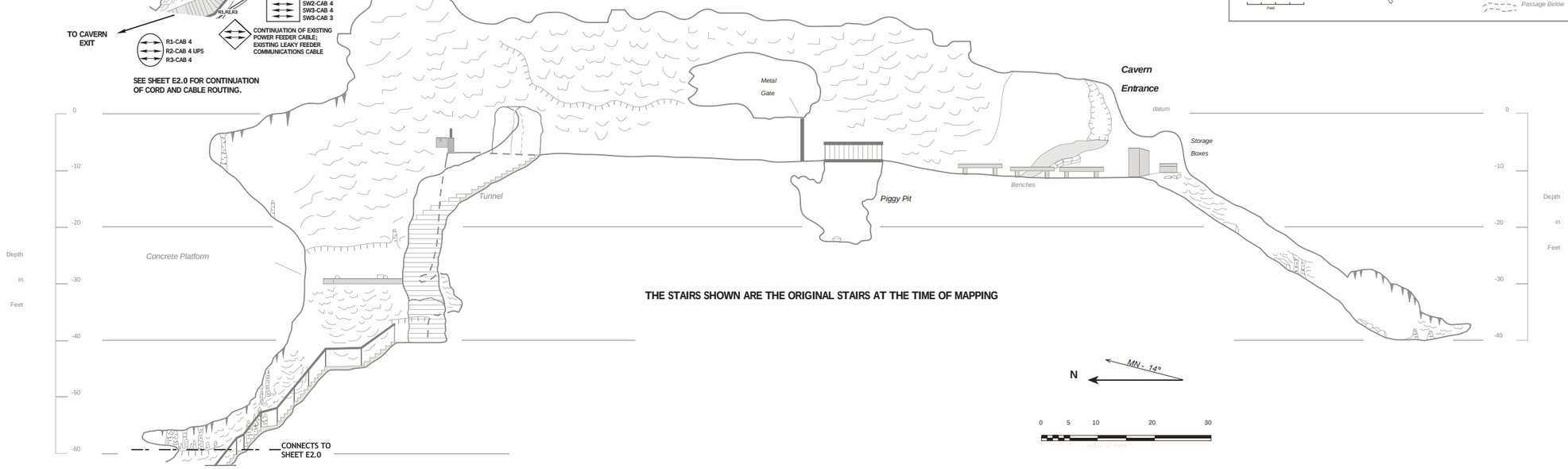
NOT TO SCALE

PLAN VIEW



CABINET #4 THIS SHEET	
R1-CAB 4	LIGHTS
R2-CAB 4	EMERGENCY LIGHTS
R3-CAB 4	LIGHTS AND EMERGENCY LIGHTS

PROJECTED PROFILE



THE STAIRS SHOWN ARE THE ORIGINAL STAIRS AT THE TIME OF MAPPING

CAVERN DRAWING KEY PLAN

DRAWING E-1.0

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PHOTO E 1.1-1
POWER FEEDER CABLE AND EXISTING COMMUNICATIONS FEEDER CABLE PATH BESIDE STAIR #1

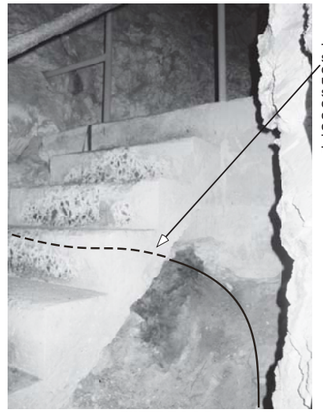

PHOTO E 1.1-2
POWER FEEDER CABLE AND EXISTING COMMUNICATIONS FEEDER CABLE PATH ALONG STAIRS AND THENCE CROSSING UNDER TRAIL

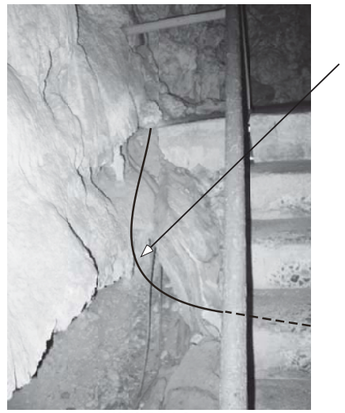

PHOTO E 1.1-3
POWER FEEDER CABLE AND EXISTING COMMUNICATIONS FEEDER CABLE PATH ALONG STAIR #2 AND THENCE CROSSING THE TRAIL

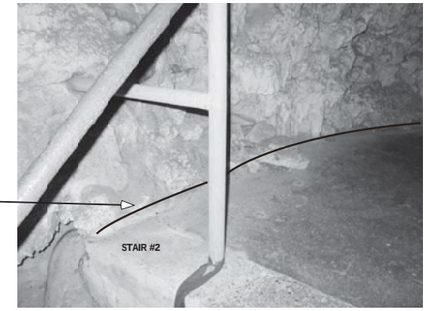

PHOTO E 1.1-4
POWER FEEDER CABLE AND EXISTING COMMUNICATIONS FEEDER CABLE PATH ABOVE STAIR #2 AND THENCE ALONG THE TRAIL

PHOTO E 1.1-5
POWER FEEDER CABLE AND EXISTING COMMUNICATIONS FEEDER CABLE PATH ALONG TRAIL BELOW STAIR #1

SAFETY OFF AND DEMOLISH EXISTING CONDUIT AND LIGHT FIXTURE SUPPLY BACK TO JUNCTION BOX OR CUT OFF FLUSH WITH TRAIL SURFACE AFTER THE NEW RAILING HAS BEEN INSTALLED.

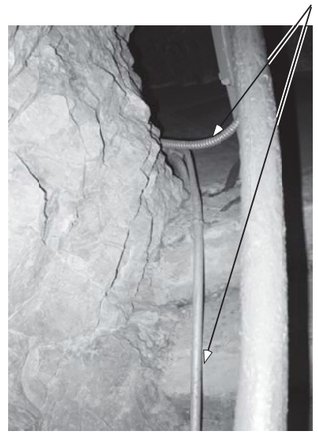

PHOTO E 1.1-6
DEMOLITION WORK AT THE TOP OF STAIR #1

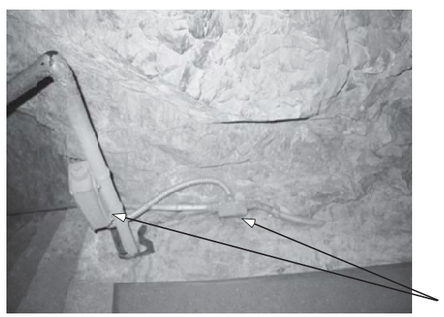

PHOTO E 1.1-7
DEMOLITION WORK AT THE TOP OF STAIR #1

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